LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 40, ANTELOPE VALLEY, REGIONS 4, LANCASTER, AND 34, DESERT VIEW HIGHLANDS, WATER SYSTEM

PUBLIC HEALTH GOALS REPORT

JULY 1, 2010

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I. Background

Section 116470 (b) of the California Health and Safety Code specifies that public water systems serving more than 10,000 service connections are required to prepare a triennial report if their water quality measurements have exceeded any Public Health Goals (PHGs). PHGs, which are non-enforceable goals, are standards for water quality constituents established by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA). Current law requires that where OEHHA has not adopted a PHG for a constituent, the water suppliers are to use the Maximum Contaminant Level Goals (MCLGs) adopted by the United States Environmental Protection Agency (USEPA). Only constituents which have a California primary drinking water standard and for which either a PHG or MCLG has been set are to be addressed.

This report provides information required by law for water quality constituents that were detected in the Lancaster/Palmdale water system (System) of Los Angeles County Waterworks Districts No. 40, Antelope Valley, Regions 4 and 34 at a level exceeding an applicable PHG or MCLG. Included in the report is information on the numerical public health risk associated with the Maximum Contaminant Level (MCL) and the PHG or MCLG, the category or type of risk to health that could be associated with each constituent, the best treatment technology available that could reduce the constituent level, and an estimate of the cost to install that treatment if it is appropriate and feasible.

II. Definition of PHGs and MCLGs

PHGs are standards that are established by OEHHA and are based solely on public health risk considerations. None of the practical risk-management factors that are considered by the USEPA or the California Department of Public Health (CDPH) in setting drinking water standards (MCLs) are considered when setting PHGs. These factors include analytical detection capabilities, available treatment technologies, benefits, and costs. MCLGs are the Federal equivalent of the State PHGs.

III. Best Available Treatment Technology

Both the USEPA and the CDPH adopt what are known as Best Available Technologies (BATs) which are the best known methods of reducing regulated contaminant levels to the MCL. Costs can be estimated for such technologies. However, since many PHGs and MCLGs are set lower than the MCLs, it is not always possible nor feasible to determine what treatment is needed to further reduce a constituent to or near a PHG or MCLG, many which are set at zero.

Estimating the costs to reduce a constituent to zero is difficult, if not impossible, because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to try and further reduce very low levels of one constituent may have adverse affects on other aspects of water quality.

IV. Definitions

The following terms will be used to describe health effects from detected constituents in the section, below.

acute toxicity – adverse health effects that develop after a short-term exposure to a chemical (minutes to days).
chronic toxicity – adverse effects that usually develop gradually from low levels of chemical exposure over a long period of time (months to years).
carcinogenic – capable of producing cancer.
mutagenic – capable of inducing mutation or increasing its rate.
teratogenic – capable of interfering with normal embryonic development.

IV. Constituents Detected That Exceed a PHG or MCLG

The following is a discussion of water quality constituents that were detected in the System above the PHG or if no PHG is available, above the MCLG.

A. Arsenic

The PHG for arsenic is 0.004 micrograms per liter (ug/L). The MCL for arsenic was reduced to 10 ug/L on January 23, 2006, due to the new USEPA Arsenic Rule, dated February 22, 2002, from a previous MCL of 50 ug/L. Source water sampling is conducted on a triennial basis, unless results exceed the MCL. Water quality testing conducted upon the source water wells in the System detected arsenic levels ranging from below detectable levels (ND) ug/L to 51.8 ug/L. During this period no water with arsenic concentrations above the MCL were distributed to the customer due to the high arsenic wells either being offline or blended with low arsenic wells. Arsenic is primarily categorized as a public health risk from chronic toxicity as a carcinogen which could damage the bladder and lungs in males. The numerical health risk for lifetime exposure to arsenic at the MCL of 10 ug/L is up to 23 in 10,000 for bladder cancer in males and up to 18 in 10,000 for lung cancer in males. The estimated unit risk for lung and bladder tumors combined for both sexes was found to be 2.7×10^{-4} $(ug/L)^{-1}$. This translates to an approximate health risk of 1 in 950,000 for lung and bladder tumors when exposed to arsenic for a lifetime at the PHG.

There are a few BATs for arsenic including ion exchange, activated alumina, reverse osmosis, enhanced lime softening, and enhanced coagulation/filtration. New treatment technologies are being developed for treatment of high arsenic concentrations which were not originally accepted as BATs. These new technologies include alternative adsorption media, coagulation-assisted micro-filtration, and point-of-use treatment.

The District is currently utilizing a non-treatment option: blending the water from wells that exceed the MCL with wells that do not exceed the MCL and in some cases, treated surface water. CDPH allows blending operations when the blend can be maintained at or below 80 percent of the MCL. We are currently using four blending plans where wells and treated surface water are blended in forebay tanks before the water is pumped to the distribution system. Additional blending plans are being considered to mitigate the effects of high arsenic concentrations in other areas of the District. This has proven to be the most cost effective method of reducing arsenic concentrations to meet the MCL.

A second method that has been used by the District is the partial abandonment of wells which have high arsenic concentrations. Zone testing of new wells and information gathered by the U.S. Geological Survey showed that the high levels of arsenic in the Antelope Valley were originating from a deep aquifer. Partial abandonment of existing wells utilizes a procedure where the deep portion of the well is filled with concrete and sealed off from the well so that water from the deep aquifer cannot enter the well. The District has utilized this approach on 7 wells, 6 of which were successful in lowering the arsenic produced in each well to below 10 ug/L. Additional partial abandonment projects are currently being finalized.

Treatment options have been investigated and were found to have a recurring annual cost of greater than $20 million, or $35 per customer per month. The initial partial abandonment projects have cost approximately $120,000 per well, but these are one-time expenses. Blending operations do not require any additional capital costs and simply require additional laboratory sampling and reporting.

B. Copper

The PHG for copper is 0.30 milligrams per liter (mg/L).The MCL for copper is 1.0 mg/L for source water wells. Water quality testing conducted upon the source water wells in the System detected copper levels ranging from below detectable levels (ND) to 0.051 mg/L. Copper is also sampled at household taps once every three years as part of the Lead and Copper Rule which is intended to determine the corrosivity of the water upon the plumbing in homes with copper pipes and lead solder. The 90th percentile value of the samples collected from household taps, to meet the Lead and Copper Rule requirements, cannot exceed 1.3 mg/L. For the Lancaster/Palmdale water system, the latest round of copper testing from household taps was completed in 2007. The 90th percentile value of the collected samples was 0.38 mg/L, with a range of detection from ND to 0.84 mg/L, which is higher than the PHG. The next round of sampling will be completed by August 2010.

The category of health risk for copper is acute toxicity in the form of gastrointestinal irritation in children. Persons with Wilson's disease may be at a higher risk of health effects due to copper than the general public. A numerical health risk is not calculated for copper because the chemical is considered a noncarcinogen. For noncarcinogens,

an exact numerical public health risk cannot be calculated. The PHG for noncarcinogens is set at a level which is believed to be without any significant public health risk to individuals exposed to that chemical over a lifetime.

Our system is in full compliance with the Federal and State Lead and Copper Rule. Based on our extensive sampling, it was determined according to the State regulatory requirements that we meet the action level for copper. Therefore, we are considered by the CDPH to have optimized corrosion control for our system.

In general, optimizing corrosion control is considered to be the BAT to deal with corrosion issues. We continue to monitor our water quality parameters that relate to corrosivity, such as pH, hardness, alkalinity, total dissolved solids, and will take action as necessary to maintain our system in an optimized corrosion control condition. In addition, our surface water wholesaler, the Antelope Valley-East Kern Water Agency (AVEK), adds zinc orthophosphate (a corrosion inhibitor) to the finished water processed at their treatment plant.

Since we are meeting the optimized corrosion control requirements, it is not prudent to initiate additional corrosion control treatment as it involves the addition of equipment or other chemicals and there could be additional water quality issues raised. Therefore, no estimate of cost has been included.

C. Lead

The PHG for lead is 0.20 micrograms per liter (ug/L). The water quality standard for regulating Lead within a drinking water distribution system is 15 ug/L, known as the action level.

Water quality testing is not required to be conducted upon the source water wells in the System. Lead is sampled at household taps once every three years as part of the Lead and Copper Rule which is intended to determine the corrosivity of the water upon the plumbing in homes with copper pipes and lead solder. The 90th percentile value of the samples collected from household taps, to meet the Lead and Copper Rule requirements, cannot exceed 15 ug/L. For the Lancaster/Palmdale water system, the latest round of lead testing from household taps was completed in 2007. The 90th percentile value of the collected samples was 7.12 ug/L, with a range of detection from below detectable levels (ND) to 30.7 ug/L, which is higher than the PHG. The next round of sampling will be completed by August 2010.

Lead can affect the cardiovascular, gastrointestinal, hemolymphatic, urinary, immune, nervous, and reproductive systems in chronic exposure. The principal acute effect in humans is colic, a painful condition involving cramps and gastrointestinal distress. Decreased intelligence in children and increased blood pressure in adults are among the more serious non-carcinogenic effects. Lead is a carcinogen in animals and thus is a probable carcinogen in humans but cannot be certain. Lead may cause an increased

risk of lung and stomach cancer. Because it is not certain the chemical is a carcinogen, a numerical health risk is not calculated. For noncarcinogens, an exect numberical public health risk cannot be calculated. The PHG for noncarcinogens is set at a level which is believed to be without any significant public health risk to individuals exposed to that chemical over a lifetime.

Our system is in full compliance with the Federal and State Lead and Copper Rule. Based on our extensive sampling, it was determined according to the State regulatory requirements that we meet the action level for lead. Therefore, we are considered by the CDPH to have optimized corrosion control for our system.

In general, optimizing corrosion control is considered to be the BAT to deal with corrosion issues. We continue to monitor our water quality parameters that relate to corrosivity, such as pH, hardness, alkalinity, total dissolved solids, and will take action as necessary to maintain our system in an optimized corrosion control condition. In addition, our surface water wholesaler, the Antelope Valley-East Kern Water Agency (AVEK), adds zinc orthophosphate (a corrosion inhibitor) to the finished water processed at their treatment plant.

Since we are meeting the optimized corrosion control requirements, it is not prudent to initiate additional corrosion control treatment as it involves the addition of equipment or other chemicals and there could be additional water quality issues raised. Therefore, no estimate of cost has been included.

D. Radiological Contaminants

Radiological Contaminants emit radioactive particles which are measured by an activity unit called a curie (Ci) which represents $3.7x10^{10}$ nuclear disintegrations per second. Radioactivity in drinking water is measured in picocuries (pCi) which is 10^{-12} curie.

Water quality testing conducted upon the source water wells in the System detected three radiological contaminants which exceed the PHG. These are radium-226, radium-228, and uranium. Specific information regarding each contaminant is detailed below. All forms of radioactivity are considered to be carcinogenic.

Radium-226

Radium-226 is a naturally occurring radioactive isotope formed from the decay of uranium-238. Radium-226 emits radioactive alpha particles. The PHG for radium-226 is 0.05 picoCuries per liter (pCi/L), or 0.00185 nuclear disintegrations per second per liter. There is no MCL for radium-226 by itself, but an MCL has been issued by the EPA for radium-226 and radium-228 combined at 5.0 pCi/L. Water quality testing conducted upon the source water wells in the System detected radium-226 levels ranging from below detectable levels (ND) to 0.28 pCi/L.

The numerical health risk for radium-226 is $7x10^{-5}$ at the MCL, and is negligible at the PHG.

The BATs for combined radium removal are ion exchange, reverse osmosis, and lime softening. Treatment options have been investigated and were found to have a recurring annual cost of greater than $15 million, or $25 per customer per month.

Radium-228

Radium-228 is a naturally occurring radioactive isotope formed from the decay of thorium-232. Radium-228 decays to become actinium-228 and emits a beta particle in the process. The PHG for radium-228 is 0.019 picoCuries per liter (pCi/L), or 0.00070 nuclear disintegrations per second per liter. There is no MCL for radium-228 by itself, but an MCL has been issued by the EPA for radium-226 and radium-228 combined at 5.0 pCi/L. Water quality testing conducted upon the source water wells in the System detected radium-228 levels ranging from below detectable levels (ND) to 0.88 pCi/L.

The numerical health risk for radium-228 is $3x10^{-4}$ at the MCL and negligible at the PHG.

The BATs for combined radium removal are ion exchange, reverse osmosis, and lime softening. Treatment options have been investigated and were found to have a recurring annual cost of greater than $15 million, or $25 per customer per month.

Uranium

Uranium is a naturally occurring radioactive isotope formed from the decay of uranium-238. Uranium emits ionizing radiation, which is carcinogenic, mutagenic, and teratogenic. Uranium has also been shown to affect kidney and liver functions. The PHG for uranium is 0.43 pCi/L, which is the based on the *de minimis* 10^{-6}, or one-in-a-million, lifetime cancer risk. The State of California MCL for uranium is 20 pCi/L and is based upon studies of toxicity to the kidney in rabbits. Water quality testing conducted upon the source water wells in the System detected uranium levels ranging from 0.20 pCi/L to 6.47 pCi/L.

The numerical health risk for uranium is one-in-a-million, which is also considered negligible, at the PHG level of 0.43 pCi/L.

The BATs for uranium removal are ion exchange, reverse osmosis, lime softening, and coagulation/filtration. Treatment options have been investigated and were found to have a recurring annual cost of greater than $15 million, or $25 per customer per month.

E. Coliform Bacteria

During 2007, 2008, and 2009 we collected a minimum of 132 samples each month for coliform analysis. Of these samples, a maximum of 0.75 percent were positive for coliform bacteria in a single month but check samples were negative and follow up actions were taken.

The MCL for coliform is 5 percent positive samples of all samples per month and the MCLG is zero. The reason for the coliform drinking water standard is to minimize the possibility of the water containing pathogens which are organisms that cause waterborne disease. Because coliform is only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. While USEPA normally sets MCLGs "at a level where no known or anticipated adverse effects on persons would occur," they indicate that they cannot do so with coliforms.

Coliform bacteria are an indicator organism and are not generally considered harmful. They are used because of the ease in monitoring and analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated and follow up sampling done. It is not at all unusual for a system to have an occasional positive sample. It is difficult, if not impossible, to assure that a system will never get a positive sample.

We add chlorine at our sources to assure that the water served is microbiologically safe. The chlorine residual levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the disinfection byproduct level. This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water.

Other equally important measures that we have implemented include: an effective cross-connection control program, maintenance of a disinfectant residual throughout our system, an effective monitoring program and maintaining positive pressure in our distribution system. Our system has already taken all of the steps described by CDPH as "best available technology" for coliform bacteria in Section 64447, Title 22, CCR.

V. Recommendations for Further Action

The drinking water quality of the Los Angeles County Waterworks Districts No. 40, Antelope Valley, Regions 4 and 34, meets all State of California, Department of Health Services and USEPA drinking water standards set to protect public health. To further reduce the levels of the constituents identified in this report that are already significantly below the health-based Maximum Contaminant Levels established to provide "safe drinking water," additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent levels at these already low values is uncertain. The health protection benefits of these further hypothetical reductions are not all clear and may not be quantifiable. Therefore, no action is proposed.